

CLAIMS

- 5        1. A method for atrial defibrillation in a patient in need thereof comprising:  
introducing into the patient a catheter comprising:  
an elongated catheter body having proximal and distal ends and at least one lumen  
therethrough, and  
a basket-shaped electrode assembly at the distal end of the catheter body, the  
electrode assembly having proximal and distal ends and comprising a plurality of spines  
connected at their proximal and distal ends, each spine comprising an elongated spine electrode  
along its length, the electrode assembly having an expanded arrangement wherein the spines bow  
radially outwardly and a collapsed arrangement wherein the spines are arranged generally along  
the axis of the catheter body;
- 10      introducing the electrode assembly into the heart of the patient; and  
applying defibrillation energy to the tissue through one or more of the elongated  
electrodes.
- 15      2. The method of claim 1, wherein each elongated spine electrode has a length  
ranging from about 10 mm to about 100 mm.
- 20      3. The method of claim 1, wherein each elongated spine electrode has a length  
ranging from about 30 mm to about 80 mm.
- 25      4. The method of claim 1, wherein each elongated spine electrode has a length  
ranging from about 50 to about 60 mm.
- 30      5. The method of claim 1, wherein each spine comprises a flexible wire having  
proximal and distal ends, wherein at least a portion of the flexible wire forms the elongated  
electrode.
- 35      6. The method of claim 5, wherein each spine comprises non-conductive coverings  
over the proximal and distal ends of the flexible wire.
7. The method of claim 1, wherein the catheter further comprises a tip electrode

mounted at the distal end of the electrode assembly.

5 8. The method of claim 1, wherein the catheter further comprises one or more ring electrodes mounted at or near the distal end of the catheter body.

9. The method of claim 1, wherein the electrode assembly comprises at least three spines.

10 10. The method of claim 1, wherein the electrode assembly comprises at least five spines.

15 11. The method of claim 1, wherein the electrode assembly further comprises an expander having a distal end attached to the distal ends of the spines and a proximal end attached to a control handle mounted to the proximal end of the catheter body, whereby manipulation of the control handle results in longitudinal movement of the expander relative to the catheter body to thereby expand and contract the electrode assembly.

20 12. The method of claim 11, wherein the expander has at least one lumen extending therethrough.

25 13. The method of claim 1, wherein the catheter has a length of at least about 90 cm.

14. The method of claim 1, wherein the catheter has a length ranging from about 100 cm to about 120 cm.

30 15. The method of claim 1, wherein the total amount of defibrillation energy delivered ranges from about 0.5 to about 20 joules.

35 16. The method of claim 1, wherein the total amount of defibrillation energy delivered ranges from about 1 to about 10 joules.

17. The method of claim 1, wherein the total amount of defibrillation energy delivered ranges from about 1 to about 4 joules.

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18. The method of claim 1, wherein defibrillation energy is delivered to the heart tissue through all of the spine electrodes.

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19. The method of claim 18, wherein all of the spine electrodes are shorted together.

20. The method of claim 18, wherein the total amount of defibrillation energy delivered ranges from about 0.5 to about 20 joules.

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21. The method of claim 18, wherein the total amount of defibrillation energy delivered ranges from about 1 to about 4 joules.

22. The method of claim 18, wherein the catheter further comprises one or more ring electrodes at or near the distal end of the catheter body, wherein the one or more ring electrodes are shorted together and function as a return electrode for the defibrillation energy.

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23. The method of claim 18, further comprising providing a patch electrode on the outside of the patient, wherein the patch electrode functions as a return electrode for the defibrillation energy.

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24. The method of claim 1, wherein defibrillation energy is delivered to the heart tissue through only a portion of the spine electrodes, leaving one or more spine electrodes through which defibrillation energy is not delivered to the heart tissue.

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25. The method of claim 24, wherein defibrillation energy is delivered to the heart tissue through at least half of the spine electrodes.

26. The method of claim 24, wherein the spine electrodes through which defibrillation energy is delivered are shorted together.

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27. The method of claim 26, wherein the one or more spine electrodes through which defibrillation energy is not delivered to the heart tissue are shorted together and function as a return electrode for the defibrillation energy.

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28. The method of claim 1, further comprising detecting electrical signals in the heart before, during or after the delivery of defibrillation energy using one or more ring electrodes mounted at or near the distal end of the catheter body.

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29. The method of claim 1, further comprising delivering pacing energy to the heart tissue using a tip electrode mounted at the distal end of the electrode assembly.

30. A system for atrial defibrillation in a patient comprising:

a catheter comprising:

an elongated catheter body having proximal and distal ends and at least one lumen therethrough, and

25 a basket-shaped electrode assembly at the distal end of the catheter body, the electrode assembly having proximal and distal ends and comprising a plurality of spines connected at their proximal and distal ends, each spine comprising an elongated spine electrode along its length, the electrode assembly having an expanded arrangement wherein the spines bow radially outwardly and a collapsed arrangement wherein the spines are arranged generally along the axis of the catheter body; and

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an external defibrillator electrically connected to the catheter.

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31. The system of claim 30, further comprising an interface switch box that connects the external defibrillator to the catheter and that permits the selection of spine electrodes through which defibrillation energy is to be delivered.

32. The system of claim 31, further comprising an ECG recorder electrically connected to the catheter through the interface switch box.

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33. The system of claim 32, wherein the catheter further comprises one or more ring electrodes mounted at or near the distal end of the catheter body.

10 34. The system of claim 31, further comprising an external pacer electrically connected to the catheter through the interface switch box.

15 35. The system of claim 34, wherein the catheter further comprises a tip electrode mounted at the distal end of the electrode assembly.

20 36. The system of claim 31, wherein each elongated spine electrode has a length ranging from about 10 mm to about 100 mm.

25 37. The system of claim 31, wherein the elongated spine electrode has a length ranging from about 30 mm to about 80 mm.

30 38. The system of claim 31, wherein the elongated spine electrode has a length ranging from about 50 to about 60 mm.

35 39. The system of claim 31, wherein each spine comprises a flexible wire having proximal and distal ends, wherein at least a portion of the flexible wire forms the elongated electrode.

40. The system of claim 31, wherein the electrode assembly comprises at least three spines.

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41. The system of claim 31, wherein the electrode assembly comprises at least five spines.

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42. The system of claim 31, wherein the catheter has a length of at least about 90 cm.

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43. A system for atrial defibrillation in a patient comprising:  
a catheter comprising:

an elongated catheter body having proximal and distal ends, a length of at least about 90 cm, and at least one lumen therethrough, the catheter body having one or more ring electrodes mounted at or near its distal end, and

a basket-shaped electrode assembly at the distal end of the catheter body, the electrode assembly having proximal and distal ends and comprising at least three spines connected at their proximal and distal ends, each spine comprising an elongated spine electrode along its length, wherein each spine electrode has a length ranging from about 30 mm to about 80 mm., the electrode assembly having an expanded arrangement wherein the spines bow radially outwardly and a collapsed arrangement wherein the spines are arranged generally along the axis of the catheter body, the electrode assembly having a tip electrode mounted at its distal end;

an external defibrillator electrically connected to the catheter;

an interface switch box that connects the external defibrillator to the catheter and that permits the selection of spine electrodes through which defibrillation energy is to be delivered;

an ECG recorder electrically connected to the catheter through the interface switch box.;  
and

an external pacer electrically connected to the catheter through the interface switch box.

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